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ABSTRACT

This report investigated the extent to which students in public secondary schools are taught by teachers without basic qualifications in their assigned teaching fields--i.e., at least a college minor in the fields they teach--focusing on core academic subjects (mathematics, English, social studies, science). Analysis of the study data revealed that many students are taught by out-of-field teachers: 20 percent in English classes, 25 percent in mathematics, 39 percent in life science or biology, 56 percent in physical sciences classes, and over 50 percent in history or world civilization. Low-income schools had higher levels of out-of-field teaching than did more affluent schools; schools serving predominantly minority student populations did not have higher levels of out-of-field teaching than did schools serving predominantly white students. In several fields, students in both low-track and low-achievement-level classes were more often taught by out-of-field teachers than were students in high-track and high-achievement-level classes; however, predominantly minority classes did not have higher levels of out-of-field teaching than did predominantly white classes. Students in seventh and eighth grade classes were more often taught by out-of-field teachers than were senior high students. Data tables are included. Appendix A contains standard errors; Appendix B lists additional resources on the 1990-91 Schools and Staffing Survey, which served as the basis for the study. (Contains 31 references.) (ND)

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Out-of-Field Teaching and Educational Equality

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Statistical Analysis Report October 1996

Out-of-Field Teaching and Educational Equality

Richard M. Ingersoll
American Institutes for Research

Kerry Gruber, Project Officer
National Center for Education Statistics

U.S. Department of Education
Office of Educational Research and Improvement NCES 96-040

U.S. Department of Education
Richard W. Riley
Secretary

Office of Educational Research and Improvement
Sharon P. Robinson
Assistant Secretary

National Center for Education Statistics
Pascal D. Forgione, Jr.
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Contact:
Kerry Gruber
(202) 219–1461

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Richard Ingersoll is currently an Assistant Professor in the Department of Sociology at the University of Georgia.

Executive Summary

This report presents national data on the extent to which students in the nation's public secondary schools are taught by teachers without basic qualifications in their assigned teaching fields. It seeks to address the question of whether inequalities exist in the distribution of adequately qualified teachers across and within different schools in the United States. The report is based on data from the 1990-91 Schools and Staffing Survey, a nationally representative survey conducted by the National Center for Education Statistics. The premise underlying this analysis is that adequately qualified staffing requires teachers at the secondary school level to hold, as a minimum prerequisite, at least a college minor in the fields they teach. Knowledge of subject matter does not, of course, guarantee qualified teachers, nor quality teaching. The premise is that basic subject knowledge is a necessary prerequisite for both.

This analysis focuses on the extent to which secondary level students in the core academic subjects (mathematics, English, social studies, science) are taught by teachers without at least a minor in the field; that is, what proportion of students receive out-of-field teaching? The report provides data on three questions:

1. What proportion of the nation's public secondary students are taught core academic subjects by out-of-field teachers?

2. Are students in public secondary schools that serve predominantly poverty-level or minority student populations more likely to be taught by out-of-field teachers than students in public secondary schools that serve predominantly more affluent or white students?

3. Are students in low-achievement-level, low-track, lower grade-level, or predominantly minority classes more likely to be taught by out-of-field teachers than students in high-achievement-level, high-track, higher grade-level, or predominantly white classes?

What proportion of the nation's public secondary students are taught core academic subjects by out-of-field teachers?

Given the above premise, this analysis indicates that in 1990-91, many students in public schools in grades 7-12 were taught core academic subjects by teachers without adequate educational qualifications in the fields they were assigned to teach (see table 1 and figure 1). This out-of-field teaching was not, however, due to a lack of basic education or training on the part of teachers. Indeed, almost all public secondary school teachers held bachelor's degrees, about half had graduate degrees, and over 90 percent were certified (Choy et al. 1993; Ingersoll 1995a; Blank and Gruebel 1993; National Science Foundation 1992). The source of out-of-field teaching lay in the lack of fit between teachers' fields of training and their teaching assignments. Many teachers were assigned to teach courses in fields that did not match their formal background preparation.

For example:

- One-fifth of all public school students enrolled in *English* classes in grades 7-12, or about 4,310,000 of 20,700,000 students, were taught by teachers who did not have at least a minor in English, literature, communications, speech, journalism, English education, or reading education.

- About one-quarter of all public school students enrolled in *mathematics* classes in grades 7-12, or about 4,124,000 of 15,510,000 students, were taught by teachers without at least a minor in mathematics or mathematics education.

- Thirty-nine percent of all public school students enrolled in *life science or biology* classes in grades 7-12, or about 2,120,000 of 5,520,000 students, were taught by teachers without at least a minor in biology or life science.

- Fifty-six percent of all public school students enrolled in *physical science* classes in grades 7-12, or about 3,430,000 of 6,110,000 students, were taught by teachers without at least a minor in physics, chemistry, geology, or earth science.

- Over half of all public school students enrolled in *history or world civilization* classes in grades 7-12, or about 4,330,000 of 8,030,000 students, were taught by teachers who did not have at least a minor in history.

Are students in public secondary schools that serve predominantly poverty-level or minority student populations more likely to be taught by out-of-field teachers than students in public secondary schools that serve predominantly more affluent or white students?

Numerous education critics have argued that students from poor, minority, and disadvantaged communities do not have equal access to qualified teachers in the United States (e.g., California Commission on the Teaching Profession 1985; Darling-Hammond

1987; Kopp 1992; Kozol 1991; Oakes 1990). Consistent with this view, this analysis shows that there were distinct inequalities in the extent of out-of-field teaching in the United States. But, this analysis also suggests that it is unwise to broadly generalize about the extent of these inequalities. In some cases there were differences, but in other cases there were not.

The data show that differences in the extent of out-of-field teaching in public secondary schools in the United States in 1990-91 depended on the type of school and the field examined (see table 1). Low-income schools had higher levels of out-of-field teaching in several of the core academic fields than did more affluent schools (see figure 2). In contrast, schools serving predominantly minority student populations did not have higher levels of out-of-field teaching than did schools serving predominantly white students. Again, it should be noted that this out-of field teaching was not due to a lack of basic education or training on the part of teachers. Regardless of the poverty level of schools, almost all public secondary school teachers had a college education. The source of out-of-field teaching lay in the lack of fit between teachers' fields of training and their teaching assignments. In several fields, teachers in low-income schools were more often assigned to teach courses in fields that did not match their formal background preparation.

Are students in low-achievement-level, low-track, lower grade-level, or predominantly minority classes more likely to be taught by out-of-field teachers than students in high-achievement-level, high-track, higher grade-level, or predominantly white classes?

Numerous education critics have also argued that minority and poor students are disproportionately placed in lower track and lower achievement courses in schools, which, these critics further claim, are often taught by the least qualified teachers (e.g., California Commission on the Teaching Profession 1985; Darling-Hammond 1987; Kopp 1992; Kozol 1991; Oakes 1990). Consistent with this view, this analysis shows that there were distinct variations across different kinds of classrooms in schools in the extent of out-of-field teaching. But again, this analysis suggests it is unwise to broadly generalize about the extent of inequalities. In some cases there were differences, and in other cases there were not.

In several core academic fields, students in both low-track and low-achievement-level classes were more often taught by out-of-field teachers than were students in high-track and high-achievement-level classes (see figures 3 and 4). This was not true, however, for high-minority classes. Predominantly minority classes did not have higher levels of out-of-field teaching than did classes enrolling predominantly white students (see table 2).

Among the greatest variations in out-of-field teaching were the age/grade level of students. In many fields, students in 7th and 8th grade classes were more often taught by out-of-field teachers than were senior high students (see figure 5).

This report is concerned with assessing levels of out-of-field teaching and whether there are differences in access to qualified teachers across different types of students and different types of classrooms within schools. This analysis does not, however, investigate either the causes or the consequences of out-of-field teaching. The reasons for out-of-field teaching, why some schools have more of it than others, and the consequences of out-of-field teaching for students and teachers are all important issues and deserve further investigation. This report closes by suggesting some of the implications of out-of-field teaching for education research and policy.

Introduction

Do all secondary school students in the United States have equal access to qualified teachers? Are students in low-income schools more likely to be taught by teachers without basic qualifications in their assigned teaching fields than those in more affluent schools? Do schools serving predominantly minority student populations tend to have less qualified faculties? Moreover, are there differences in access to qualified teachers across different types of students and different types of classrooms within schools?

Policy Context

Over the past several decades, equality has been one the most fundamental concerns of education policy and research in the United States. The focus of a vast amount of research and reform in education has been to uncover and address disparities in the resources and opportunities in education provided to students from different socio-economic backgrounds (e.g., Coleman et al. 1966). Among the most important of these educational resources is the teaching force. The largest single component of the cost of education in any country is teacher compensation. Moreover, teachers are, of course, a highly important part of the actual educational process, and student educational outcomes ultimately depend on the work of teachers. Indeed, it is precisely because the teaching force is a significant resource that equal access to qualified teachers and quality teaching has been a source of contention in the national debate over equality of educational opportunity.

Among those concerned with issues of educational equality, it is widely believed that students from disadvantaged backgrounds do not have equal access to qualified teachers. A number of critics have argued that, indeed, the most needy students in the United States—those from poor, minority, and disadvantaged communities—are taught by the least qualified teachers (e.g., California Commission on the Teaching Profession 1985; Darling-Hammond 1987; Kopp 1992; Kozol 1991; Oakes 1990). These critics argue that low-income and high-minority schools are unable to offer competitive salaries, benefits, or resources and, hence, simply cannot compete for the available supply of trained teachers. In this view, unequal access to qualified teachers and, hence, to quality teaching, is one of the key reasons for unequal results in student educational outcomes.

These critics argue, moreover, that patterns of unequal access to quality teachers also appear within schools. Not only do students in low-income and predominantly minority schools have less access to qualified staff, but, the critics add, low-income and minority students, when in affluent schools, also have less access to the best teachers. The latter is due to the practice of separating students and teachers by ability—the system of tracking. In this view, minority and poor students are disproportionately placed in lower track and lower achievement courses, which, these critics further claim, are taught by the least qualified teachers.

Despite the importance of this debate on educational equality and the widespread belief that schools, programs, and classes serving low-income and minority student populations have less access to quality teaching, there has actually not been much empirical research done on this issue, especially at the national level. One of the reasons for this dearth of research is the difficulty involved in obtaining data on the underlying issue of importance—the degree of actual exposure to quality teachers and quality teaching provided to students in classrooms. Assessing the caliber of teachers' classroom performance and the degree to which students have access to quality teaching in classrooms is a difficult empirical task because there is little consensus concerning both how to define and how to best measure quality teachers and teaching (e.g., Haney, Madus, and Kreitzer 1987; Ingersoll 1996a). As a result, researchers typically turn to what is more easily assessed and more readily available—measures of teacher qualifications.

Although the qualifications of teachers—such as their education, training, and preparation—are only indirect measures of the quality of teaching that students receive, they provide useful information on this important educational resource.

Education and training are essential ingredients of quality teachers and quality teaching. There is almost universal agreement that one of the most important characteristics of a quality teacher is preparation in the subject or field in which the teacher is teaching. Research has shown moderate but consistent support for the reasonable proposition that subject knowledge (knowing what to teach) and teaching skills (knowing how to teach) are important predictors of both teaching quality and student learning (for reviews of this research, see: Shavelson, McDonnell, and Oakes 1989; Darling-Hammond and Hudson 1990; Murnane and Raizen 1988). Knowledge of subject matter and of pedagogical methods do not, of course, guarantee quality teachers nor quality teaching, but they are necessary prerequisites.

The argument for the necessity of preparation and education in subject knowledge is especially clear for the secondary school level. First, at the secondary level, teachers are divided by fields into departments; faculties are thus more specialized than in elementary schools, and therefore the differences between fields are more distinct and, perhaps, greater. Moreover, the level of mastery needed to teach different subjects is higher at the secondary school level, and therefore a clear case has been made by policy analysts and researchers that such teachers ought to have adequate substantive background in the

subjects they teach (e.g., Shavelson, McDonnell, and Oakes 1989; Murnane and Raizen 1988; Darling-Hammond and Hudson 1990).

In contrast to national data on the quality of classroom teaching, national data on the basic qualifications of teachers, such as the percentages of teachers that have degrees and are certified, have been more readily available, although these data have usually been limited to specific fields (e.g., math/science) or particular levels (e.g., grade 8; senior high). Moreover, analyses of the data available have shown that the qualifications of teaching staffs do vary across different types of schools. In general, research has shown that levels of teaching staff qualifications are often lower in low-income and high-minority schools and in lower level classes within schools (e.g., Pascal 1987; Horn, Hafner, and Owings 1992; Oakes 1990). But, although there appear to be some inequities, the data also show that very few public school teachers are without at least basic teaching qualifications, regardless of the type of school. Indeed, almost all public school teachers hold bachelor's degrees, about half have graduate degrees, and over 90 percent are certified (Choy et al. 1993; Ingersoll 1995a; Blank and Gruebel 1993; National Science Foundation 1992). As a result, it appears that, regardless of the type of school, the vast majority of public school students are taught by teachers with at least basic education and qualifications.

Although more readily available than data on teaching quality, there have also been problems with the data available on teacher qualifications and student access to qualified teachers in the United States. Assessing disparities in access to qualified teachers requires not simply examining whether teachers are trained, but whether they are trained in the actual subjects they are assigned to teach. In contrast to data on teacher qualifications and education, much less information has been available on the extent to which trained teachers are teaching subjects for which they have little training—the phenomenon of out-of-field teaching.

In order to address fully the issue of access to qualified teachers, it is necessary to distinguish between teacher training and teaching assignment. These represent two distinct elements in the assessment of teacher qualifications. Teacher training refers to the quantity and quality of teacher education and preparation. Assessments of training levels typically examine whether teachers have a basic college education and expertise in a specialty field. On the other hand, the element of assignment or placement of teachers focuses on whether the fields of training and preparation of the teacher match the teaching fields of the teacher. Assessments of teachers' assignments need to examine whether teachers are assigned to teach in fields for which they have adequate background. In this view, teachers trained in social studies, for example, are unlikely to have a solid understanding of physics. Hence, the source of underqualified teaching may lay either in inadequate training or in a lack of match between teachers' fields of training and their teaching assignments. It is important to distinguish between these two elements in assessments of teacher qualifications because they have very different implications for policy. If underqualified teaching is due to inadequacies in the quantity or quality of

teacher education and preparation, it is probable that the source of the problem may lie with teacher education programs and standards. On the other hand, if underqualified teaching is due to high levels of mismatch between teachers' fields of training and their teaching assignments, then it is probable that the source of the problem may lie with the supply of teachers or the management of schools.

The problem for research on teacher qualifications has been a lack of necessary data, especially at the national level, to assess the degree of match and mismatch between teacher training and assignment—a problem repeatedly voiced over the past decade by numerous analysts (e.g., Shavelson, McDonnell, and Oakes 1989; Darling-Hammond and Hudson 1990; Murnane and Raizen 1988; Haggstrom, Darling-Hammond, and Grissmer 1988). Moreover, there has been little information on the numbers of students actually taught by out-of-field teachers—information crucial to understanding disparities in student access to qualified teaching.

Analysis for This Report

In order to address these and other data needs concerned with the staffing, occupational, and organizational aspects of schools, in the late 1980s the National Center for Education Statistics (NCES) designed and conducted the Schools and Staffing Survey (SASS), a major new survey of teachers and schools. NCES has since sponsored several projects designed to define and assess out-of-field teaching in the United States (McMillen and Bobbitt 1993; Bobbitt and McMillen 1995; Ingersoll 1995a). These previous analyses have shown that, in fact, out-of-field teaching is extensive in U.S. schools. Moreover, these analyses have documented that this underqualified teaching was not due to a lack of basic education or training on the part of teachers. The source of out-of-field teaching lay in the lack of fit between teachers' fields of training and their teaching assignments. Most teachers have training, such as a college major, in their main field of assignment. But, many teachers, especially at the secondary level, are also assigned to teach additional courses in fields for which they have little or no formal background preparation.

This report expands on this earlier work by analyzing national data from the 1990-91 SASS to examine the issue of disparities in student access to qualified teachers. This analysis differs from most previous research on educational equality and teacher qualifications in three ways. First, it focuses on *out-of-field teaching*. Researchers typically examine the quantity of teachers with degrees or with certification, or the quantity of those with degrees or certification in their main teaching assignments. In contrast, this analysis focuses on the proportion of teachers teaching subjects who do not have adequate qualifications in those subjects, regardless of whether it is their main or secondary teaching assignment.

Second, this analysis utilizes a *conservative standard* in defining adequate qualifications. There is a great deal of disagreement as to what constitutes a sufficient quantity and quality of preparation for a teacher to be considered adequately trained. Rather than

enter the debate as to what constitutes a qualified teacher, quality teaching, or quality teacher training, this analysis adopts a minimal definition of adequate training. The premise underlying this analysis is that adequately qualified staffing requires teachers, especially at the secondary school level and especially in the core academic fields, to hold, as a minimum prerequisite, at least a college minor in the fields taught. The analysis focuses on whether teachers who teach the core academic subjects (mathematics, English, social studies, science) at the secondary level have a basic or minimal education in those subjects. Basic, minimal, or adequate education here refers to teachers having at least a minor in each of the fields they are assigned to teach. In this view, even a moderate number of teachers lacking such minimal training prerequisites is a strong indication of inadequacies in the staffing of schools.

Third, this analysis focuses on *students*. Rather than examining how qualified teachers are, this analysis focuses on the proportion of students being taught by teachers without basic qualifications. Addressing the issue of disparities in student access requires assessing how many students are actually exposed to out-of-field teaching.

The analysis examines whether access to qualified teachers is equally distributed across different student populations. It begins by focusing on differences between high-poverty and low-poverty schools, and also between high-minority and low-minority schools. Many researchers assume that the high-poverty and minority populations are one and the same. It is important, however, to examine the data on out-of-field teaching by these two characteristics separately, because previous research has suggested that differences in the levels of teacher qualifications are not always the same across them (Pascal 1987).

The analysis also examines within-school differences in teacher qualifications across classes of different student achievement levels, of different student ability groupings, and of different student races and ethnicities. Again, it is also important to examine out-of-field teaching separately by these three sets of characteristics because it cannot be assumed that their relationships to teacher qualifications are the same.

Finally, this analysis examines within-school differences in teacher qualifications across different secondary school grade levels—specifically, grades 7 through 12. Although many may agree that basic education is an essential prerequisite of qualified teachers, there is probably less agreement on whether out-of-field teaching has as serious consequences at the junior high level as it has for the senior high grades. Hence, it is important to distinguish among grades at the secondary level and to determine whether there are, in fact, differences in out-of-field teaching levels across these different grade levels.

Thus, the analysis in this report addresses the following questions:

1. What proportion of the nation's public secondary students are taught core academic subjects by out-of-field teachers?

2. Are students in public secondary schools that serve predominantly poverty-level or minority student populations more likely to be taught by out-of-field teachers than students in public secondary schools that serve predominantly more affluent or white students?

3. Are students in low-achievement-level, low-track, lower grade-level, or predominantly minority classes more likely to be taught by out-of-field teachers than students in high-achievement-level, high-track, higher grade-level, or predominantly white classes?

Data and Methods

Data

The data source for this study is the nationally representative 1990-91 Schools and Staffing Survey (SASS). The U.S. Census Bureau collected these data for NCES in early 1991 from a random sample stratified by state, sector, and school level. The 1990-91 SASS included four sets of linked questionnaires: for each school sampled, for the principal or headmaster of each school, for the central district board of each public school, and for faculty within each school. Within each school, from 3 to 20 teachers (average of 4) were randomly sampled, depending on school level, size, and sector.

SASS is particularly useful for addressing questions concerned with teacher qualifications. It is the largest and most comprehensive dataset available on teachers and school staffing characteristics in the United States. Indeed, as indicated earlier, this survey was conducted because of the paucity of nationally representative data on such issues. SASS, for example, includes a wide range of information on the training, education, qualifications, and teaching assignments of teachers that can be disaggregated by field and also disaggregated by the characteristics of schools, students, and classrooms.[1] More detail on the technical aspects of the 1990-91 SASS are included in the Technical Notes at the end of this report.[2]

The sample utilized in the analysis consists of 25,427 public school teachers, including those employed both full-time and part-time. This analysis focuses solely on those teaching at the secondary school level (grades 7 through 12), regardless of whether the

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[1] For a detailed discussion of the original rationale, conceptualization, and design of SASS, see the Rand Corporation report by Haggstrom, Darling-Hammond, and Grissmer (1988).

[2] For information concerning the survey design and sample estimation of SASS, see Kaufman and Huang (1993). For information about the quality of the data in SASS, see Jabine (1994). For manuals on use of SASS, see Gruber, Rohr, and Fondelier (1993). For an extensive report summarizing the items used in this report and providing an overview of the entire survey, see Choy et al. (1993).

school was actually a middle school, junior high school, a senior high school, a secondary school, or a combined school. Furthermore, it solely focuses on those who taught departmentalized courses in any of the core academic fields (English, mathematics, science, social studies). For example, 7th or 8th grade teachers teaching multiple subjects in self-contained classes were excluded from the analysis. Likewise, the non-7-12th grade portions of the schedules of teachers in combined schools or middle schools were excluded.

For each class period in the school day of each of the sampled teachers, data were collected on the subject taught, grade level, class type or track, student achievement level, student race-ethnicity, and the number of students enrolled. In addition, teachers reported their certification status and their major and minor fields of study for each of their degrees earned, at both the undergraduate and graduate levels. These data were used to develop the measures of out-of-field teaching for this analysis.

Measures

Empirical examination of the extent to which teachers are assigned to teach in fields for which they do or do not have adequate or appropriate training is difficult because "adequate" or "appropriate" background training and preparation can be defined in a number of different ways. The most commonly used measures focus on whether teachers are certified in their teaching assignments. But, even as an indicator of basic training, whether or not a teacher has certification has limits. Teacher certification requirements and the quality of teacher training programs vary widely across states; some, for instance, include a major in a substantive field, and some do not (Tryneski 1992; Feistritzer 1990).

The definition of teaching assignment is also not straightforward. The most commonly used measures focus on teachers' main teaching assignments. But, it is possible for teachers, especially at the secondary school level, to teach in more than one field. Physical education teachers, for example, may not simply teach physical education; they may have additional assignments. As a result, it is unclear how much of teachers' class schedules are excluded in measures limited to teachers' main assignments.

Moreover, teaching fields can be defined and subdivided in different ways, both narrowly and broadly. For instance, a broad definition of the field of social studies might consider within-department assignments, such as history teachers teaching classes in economics, to be in-field. A narrow definition, on the other hand, might require teachers of economics to have a degree in economics to be considered in-field. The definition of field used in an analysis can affect the amount of out-of-field teaching found.

Finally, it is difficult to determine how many students are actually affected when examining measures of the numbers of teachers teaching out of field. Some teachers may teach many large sections out of field, while others may teach a few small classes out of field.

This analysis builds on earlier work that has developed and compared a range of different measures of out-of-field teaching (McMillen and Bobbitt 1993; Bobbitt and McMillen 1995; Ingersoll 1995a). The measure used in this analysis examines the **percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field.** This measure of out-of-field teaching differs from those most commonly used in research on access to qualified teachers; hence, its features and rationale merit some explanation.

This measure of out-of-field teaching focuses on *students*. Rather than focusing on the proportions of teachers teaching out-of-field, this analysis focuses on the proportion of students being taught by out-of-field teachers. This measure allows the analysis to address the issue of disparities of student access because it illuminates how many students are actually exposed to out-of-field teaching.

This measure of out-of-field teaching focuses on *minimal levels* of background preparation in broadly defined fields. The analysis defines adequate training not as a college major, but as a college minor, which may require passing only a small number of undergraduate courses in a field. Rather than enter the debate as to what constitutes a qualified teacher, quality teaching, or quality teacher training, this analysis presents data on students taught by teachers who lacked even basic prerequisites in the fields they were assigned to teach. Hence, this measure is conservative and may, in fact, *understate* the level and degree of underqualified or out-of-field teaching. The underlying premise is that even a moderate number of teachers lacking such minimal training prerequisites is a strong indication of inadequacies in the staffing of schools.

Adequate training is defined in terms of *substantive background*. This measure of out-of-field teaching indicates how many students were taught by teachers who did not hold at least a college minor in the subject field, regardless of whether they had training in teaching methods or whether they were certified or not. Hence, it refers to teachers' substantive education, not their pedagogical training. However, both education majors and minors and liberal arts majors and minors are defined here as substantive background. Hence, a teacher with either a minor in mathematics education or with a minor in mathematics who was teaching mathematics is defined as in-field. It should be noted that many teachers held multiple degrees, and many held multiple majors and minors; hence, many are defined as in-field in more than one field. It should also be noted that this measure does not account for informal training or life experiences that may have imparted substantive knowledge to teachers. Moreover, this measure does not count as qualified those who have college credits in a field but do not have a minor or major in the field. In such cases, a teacher would be defined as out-of-field who may, in fact, be qualified in that field.

This measure of out-of-field teaching focuses on the students enrolled in and teachers assigned to the *core academic fields*. These fields are defined first broadly and then narrowly in this analysis. First, the core academic subjects and college major/minors are

broadly categorized into four fields parallel to conventional core academic departments in secondary schools: English, mathematics, science, and social studies. To be defined as in-field, English teachers must hold at least a minor in either English, English education, language arts, literature, reading, communication, or journalism. Mathematics teachers must hold at least a minor in either mathematics, engineering, or mathematics education. Science teachers must hold a minor in any of the sciences. Social studies teachers (i.e., history, economics, civics, world civilization) must hold at least a minor in one of the social sciences, in history, or in social studies education.[3]

Second, because both social studies and science are broad multidisciplinary fields, the analysis also subdivides them into some of their components for separate examination. Within the field of social studies, history is separately assessed. In this case, to be defined as in-field, teachers of either history or world civilization classes must hold at least a minor in history, rather than simply a minor in any social science.

Likewise, within the field of science, the physical sciences and the life sciences are also subdivided and separately assessed. In the first case, teachers of any physical science course (e.g., physics, chemistry, geology, or other physical science) are required to hold at least a minor in one of the physical sciences (e.g., physics, chemistry, or geology) to be defined as in-field, rather than simply a minor in any science. Hence, within the subfield of physical science, a teacher of physics with a minor in chemistry is defined as in-field. But, a teacher of physics with a minor in biology, and without at least a minor in one of the physical sciences, is defined as out-of-field.

Within the subfield of life science, to be defined as in-field, teachers of any life science or biology courses must hold at least a minor in biology or life science to be defined as in-field. Hence, within the subfield of life science, a teacher of biology with a minor in physics, and without at least a minor in either biology or life science, is defined as out-of-field.

Finally, it must be noted that not all instances of out-of-field teaching are of equal magnitude. For instance, a teacher with a degree in English is probably less prepared to teach mathematics than a teacher with a degree in chemistry. However, both are defined as out-of-field. Moreover, some fields of physical science require substantial credits in mathematics, making such teachers more than minimally qualified to teach mathematics courses. On the other hand, the reverse may not be true; a degree in mathematics would not necessarily qualify a teacher to teach physical science courses. Hence, defining fields along departmental lines, as in the measure used here, ignores some cases where what is defined as out-of-field teaching may not actually be misqualified teaching.

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[3] See the Technical Notes for a chart showing the categorization of disciplines and subjects into fields of training and fields of teaching assignment.

Methods

The objective of this analysis is to examine differences in the levels of out-of-field teaching among different types of schools, based on the poverty level and race-ethnicity of the students enrolled. In addition, the analysis examines out-of-field differences across different kinds of classrooms within schools. The measures of school and classroom characteristics are described below.

School Characteristics

Data were collected from school administrators on the poverty level and race-ethnicity of the students enrolled in each sample school. These data provided two measures of school characteristics for the analysis:

Minority enrollment of school: percentage of nonwhite students in each school (Asian, Pacific Islander, American Indian, Alaskan Native, Hispanic, Black)

Low-minority: less than 15 percent
Medium-minority: 15 percent to 50 percent
High-minority: 50 percent or more

Poverty enrollment of school: percentage of students in each school receiving the federal free or reduced-price lunch program, which is synonymous with students from low-income families

Low-poverty: less than 15 percent
Medium-poverty: 15 percent to 50 percent
High-poverty: 50 percent or more

Classroom Characteristics

The sampled teachers provided information on the grade level, class type or track, student achievement level, and student race-ethnicity for each class in their school day. From this data, several measures of classroom characteristics were developed and used in the analysis:

Achievement level of class: teachers' reports of "achievement level of students in classroom compared to other students in the school"

Low-achievement: primarily lower achieving students
Average-achievement: primarily average achieving students
High-achievement: primarily higher achieving students

Type or track of class: teachers' reports of "type of class"

Low-track: general, remedial, vocational, special education
Medium-track: academic/college preparatory
High-track: honors, advanced placement, gifted

Minority enrollment of class: teachers' reports of "number of students in the class who were Black, Hispanic, American Indian, Alaskan Native, Pacific Islander, or Asian"

Low-minority: less than 15 percent
Medium-minority: 15 percent to 50 percent
High-minority: 50 percent or more

Grade level of class: teachers' reports of "the grade level of most of the students in the class"

Grades 7 through 12

It is important to note several limitations of two of the above classroom measures: achievement levels of classrooms and the type or track of classrooms. These measures are based on teachers' self-reports, and different teachers within the same school may use different sets of criteria to define different student achievement levels or class types. Schools themselves may also differ in the manner in which they group students by achievement level and ability (see Carey and Farris 1994). In addition, schools may differ in the extent to which they employ student ability and achievement grouping. For instance, particular schools may use all, some, or none of the class types and achievement levels identified above. Hence, it cannot be assumed that these classroom categories are consistent across the sample. Moreover, in order to simplify the comparisons in the case of different class types or tracks, the analysis grouped eight types utilized in the SASS questionnaire into three tracks—low, medium, and high—as shown above. Simplification may, however, mask differences. For instance, combining special education, general, remedial, and vocational classes into one category—low-track—may obscure differences among them. For all of these reasons, the measure of classroom achievement levels and the measure of class tracks should be interpreted with some caution in the analysis.

All figures and estimates presented in this report are based on samples and, hence, are subject to sampling error. Standard errors indicating the accuracy of the estimates are included in Appendix A. Caution should be used in interpreting estimates in the tables that have relatively large standard errors. The standard method of assessing this is by calculating a statistic known as the coefficient of variation, which is the ratio of the standard error to the estimate. Estimates with coefficients of variation greater than 30 percent are noted with an asterisk and should be interpreted with some caution. All comparisons and differences in levels of out-of-field teaching discussed in the report itself are statistically significant at a 95 percent level of confidence, unless otherwise noted. At

times, what may appear to be a difference in levels of out-of-field teaching between, for example, two types of schools, may actually not be of statistical significance. This does not mean there is no real difference in the actual population of schools in the United States. It means that the apparent difference between the sample estimates is simply not great enough to conclude that it could not be due to random variation in the sample. More details on the determination of statistical significance in this analysis are included in the Technical Notes.

Results

What proportion of the nation's public secondary school students are taught core academic subjects by out-of-field teachers?

Overall in 1990-91, substantial proportions of students in public secondary schools in the United States were taught academic subjects by teachers without basic qualifications in those subjects. The proportions of public secondary school students taught in each of the core academic fields by teachers without at least a minor in the field are presented in table 1 and figure 1.

For example, about one-fifth of all public school students enrolled in *English* classes in grades 7-12, or about 4,310,000 of 20,700,000 students, were taught by teachers who did not have at least a minor in English, literature, communications, speech, journalism, English education, or reading education. In addition, over one-quarter of all public school students enrolled in *mathematics* classes in grades 7-12, or about 4,124,000 of 15,510,000 students, were taught by teachers without at least a minor in mathematics or in mathematics education. In *science*, 17 percent of all public school students enrolled in science classes in grades 7-12 were taught by teachers without at least a minor in any of the sciences or in science education. Overall, a relatively low proportion of students were taught *social studies* out of field; 13 percent of students enrolled in social studies were taught by teachers without at least a minor in any of the social sciences, in public affairs, in social studies education, or in history.

Within the sciences, levels of out-of-field teaching increased dramatically when science as a whole was subdivided between the *physical and life sciences*. This suggests that there was a great deal of within-science, but cross-discipline, out-of-field teaching. That is, if the definition of in-field required a teacher of physics, chemistry, geology, or physical science to have at least a minor in physics, chemistry, or geology, rather than simply a minor in any science, then the overall amount of out-of-field teaching greatly increased. Fifty-six percent of all 7-12 students enrolled in physical science classes, or about 3,430,000 of 6,110,000, were taught by teachers without at least a minor in any of the physical sciences. Likewise, if the definition of in-field required a teacher of biology or life science

to have at least a minor in biology or life science, rather than in simply in any science, then the overall amount of out-of-field teaching greatly increased.

Levels of out-of-field teaching also increased dramatically when *history* was defined as a separate field, again suggesting that there was a great deal of within-social studies, but cross-discipline, out-of-field teaching. Over half of all 7-12 students enrolled in history or world civilization classes, or about 4,330,000 of 8,030,000 students, were taught by teachers without at least a minor in history itself.

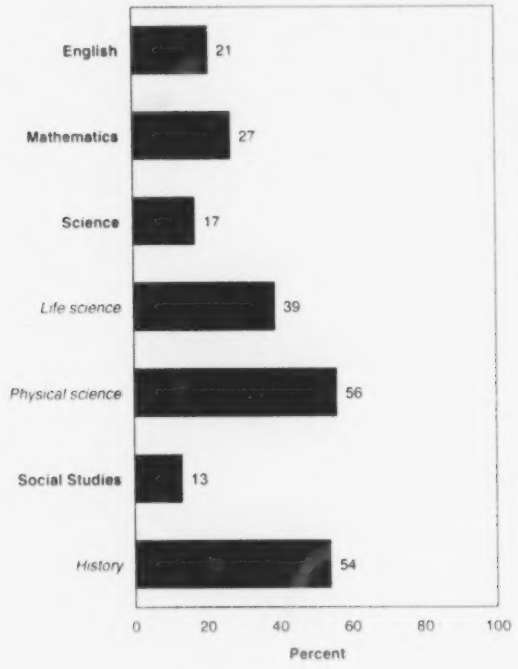
Table 1. Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and selected *school* characteristics: 1990-91

	English	Math	Science	*Life Science*	*Physical Science*	Social Studies	*History*
Total	20.8	26.6	16.5	38.5	56.2	13.4	53.9
Minority Enrollment of School							
Low-minority	20.0	24.3	13.9	36.8	58.0	11.6	56.3
Medium-minority	19.1	23.1	16.6	40.2	52.7	15.6	49.9
High-minority	24.4	33.6	17.8	33.8	56.7	14.4	54.2
Poverty Enrollment of School:							
Low-poverty	15.6	20.6	11.9	34.1	50.4	11.6	54.3
Medium-poverty	21.7	30.1	16.0	39.2	59.4	14.5	53.0
High-poverty	33.2	32.6	29.3	45.3	70.6	15.3.	55.0

NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Figure 1. Percentage of public secondary school students in classes taught by teachers without at least a minor in the field, by field: 1990-91



NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

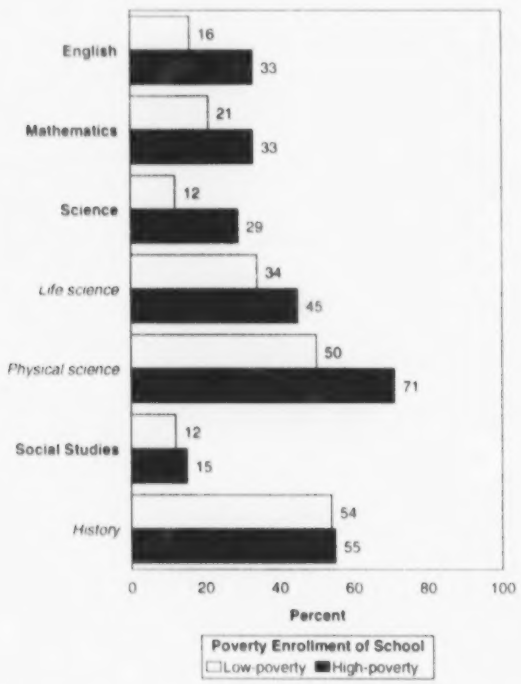
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Are students in public secondary schools that serve predominantly poverty-level or minority student populations more likely to be taught by out-of-field teachers than students in public secondary schools that serve predominantly more affluent or white students?

In 1990-91, there were also differences in the amount of out-of-field teaching across different types of schools, but this depended on the type of schools compared and the fields examined (see table 1). Notably, although in some fields there appear to have been slight differences in levels of out-of-field teaching between high- and low-minority schools, in no fields were these differences statistically significant. In contrast, school poverty levels were related to the amount of out-of-field teaching, and the differences were in the direction predicted by the literature on educational inequality. That is, in no fields did high-poverty schools have less out-of-field teaching than low-poverty schools, while in several fields, students in high-poverty schools received distinctly more out-of-field teaching than in low-poverty schools (see figure 2). For example, one-third of

English students in high-poverty schools, as opposed to 16 percent in low-poverty schools, were taught by teachers who did not have at least a minor in English, English education, language arts, literature, reading, communication, or journalism. Moreover, there were distinct differences in the amount of out-of-field teaching in physical science between high- and low-poverty schools.

Figure 2. Percentage of public secondary school students in classes taught by teachers without at least a minor in the field, by field and poverty enrollment of school: 1990-91



NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Although there also appear to have been differences in the proportions of students being taught out-of-field life science or math across high- and low-poverty levels, these were not statistically significant. There was, in addition, little difference in out-of-field teaching in both social studies and history between schools of different poverty levels. Regardless of the students' poverty level, all schools had relatively low levels of out-of-field teaching in social studies and relatively high levels of out-of-field teaching in history.

Are students in low-achievement-level, low-track, lower grade-level, or predominantly minority classes more likely to be taught by out-of-field teachers than students in high-achievement-level, high-track, higher grade-level, or predominantly white classes?

In 1990-91, the amount of out-of-field teaching was not equally distributed across different types of classes and groups in schools. These data are displayed in table 2 and figures 3-5. Both student achievement levels and type or track of class were related to access to qualified teachers. In each case, the pattern was similar; low-track and low-achievement classes often had more out-of-field teaching than did high-track and high-achievement classes. For example, in English and physical science, students in low-achievement classes were more often taught by out-of-field teachers than in high-achievement classes (see figure 3).

Likewise, in several fields, students in high-track classes experienced less out-of-field teaching than did those in the low-track classes (see figure 4). For instance, about one-tenth of students in high-track English classes were taught by out-of-field teachers. But, about one-quarter of those in low-track English classes received out-of-field teaching. However, little difference was found in levels of out-of-field teaching between the two higher tracks—the honors/gifted/AP track and the college preparatory track.

In contrast to achievement levels and tracks, there was little difference in out-of-field teaching between predominantly white and predominantly minority classes (see table 2). In none of the fields was there a statistically significant difference in out-of-field teaching between high-minority classes and low-minority classes.

However, some distinct differences were found between the junior high school grade levels and the senior high school grade levels (see figure 5). Students in grade 7 were more likely to have received out-of-field teaching than were 12th grade students in all fields, with the exception of history and math. For example, about one-third of science students in 7th grade were taught by teachers without at least a minor in any of the sciences or science education, while this was true for only about one-tenth of the math students in 12th grade. In some fields, students in grade 8 were also more likely to have received out-of-field teaching than were 12th grade students. However, distinct differences were not found *among* the senior high grade levels. Ninth grade students, for example, were not necessarily more likely to have been taught by an out-of-field teacher than were 12th grade students.

For purposes of comparison, table 3 provides additional background data on differences in the amount of out-of-field teaching across the 50 states.

Table 2. Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and selected *classroom* characteristics: 1990-91

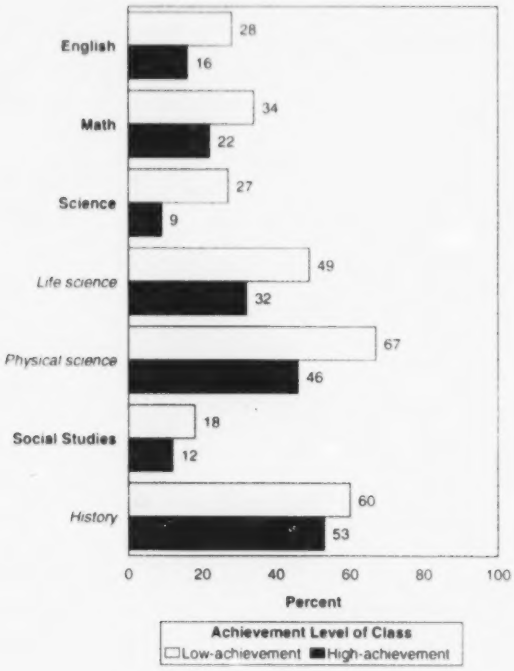
	English	Math	Science	*Life Science*	*Physical Science*	Social Studies	*History*
Total	20.8	26.6	16.5	38.5	56.2	13.4	53.9
Achievement Level of Class:							
Low-achievement	28.2	33.7	26.6	48.7	66.7	18.4	60.1
Average-achievement	19.0	25.6	15.2	33.7	58.0	12.5	52.1
High-achievement	16.3	21.6	9.2	32.0	45.5	11.8	52.6
Type or Track of Class:							
Low-track	24.7	33.5	20.4	42.3	66.8	14.3	55.1
Medium-track	11.8	15.7	9.2*	31.4	42.8	8.9	44.9
High-track	11.2	20.4*	7.2*	20.7	43.0	11.2	51.1
Minority Enrollment of Class:							
Low-minority	19.2	22.7	14.6	36.6	56.3	12.3	55.6
Medium-minority	19.9	24.2	17.7	42.8	54.1	15.0	52.7
High-minority	25.2	36.1	19.6	37.6	58.7	14.3	51.4
Grade Level of Class:							
7th grade	32.2	48.8	31.8	60.4	73.8	23.9	56.3
8th grade	32.9	37.1	23.8	32.9*	75.7	19.7	60.5
9th grade	15.7	18.1	10.7	27.9	61.7	8.7	48.7
10th grade	11.1	16.8	8.9*	29.3	45.7	8.8	51.1
11th grade	11.2	15.9	6.4	23.5*	36.8	6.8	47.0
12th grade	13.9	24.2	13.1*	25.3*	41.0	11.3	62.4

* Coefficient of variation greater than 30 percent.

NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

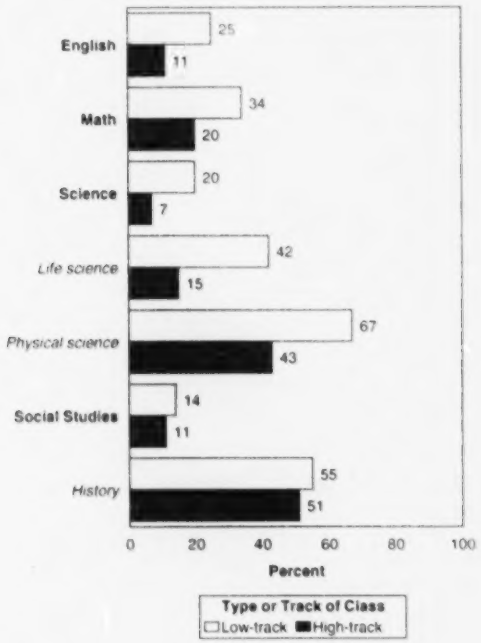
Figure 3. **Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and achievement level of class: 1990-91**



NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

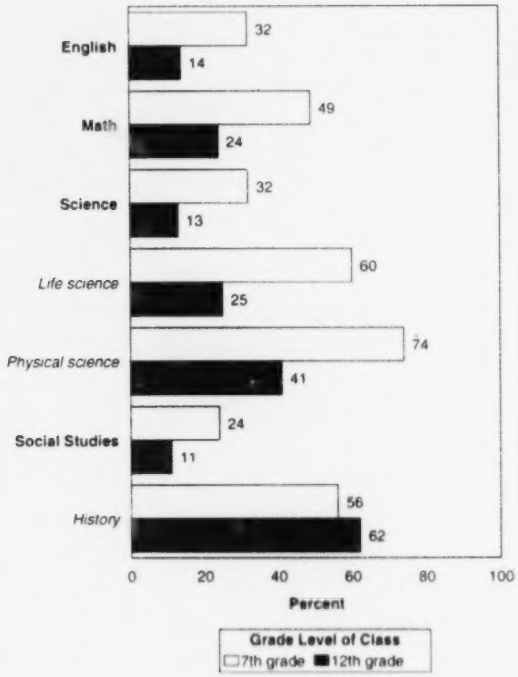
Figure 4. **Percentage of secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and type or track of class: 1990-91**



NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Figure 5. **Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and grade level of class: 1990-91**



NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Table 3. Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and by *state*: 1990-91

State	English	Math	Science	*Life Science*	*Physical Science*	Social Studies	*History*
TOTAL PUBLIC	21	27	17	39	56	13	54
Alabama	22	13	23	50	68	14	48
Alaska	21	40*	11*	--	78	14*	--
Arizona	32	30	13*	28*	49	19	71
Arkansas	12*	12*	15*	47*	72	14*	57
California	22	42	17*	33	57	18	46
Colorado	16	26	15*	30*	42	12	64
Connecticut	17*	19*	13*	--	--	11*	--
Delaware	--	--	--	--	--	--	--
District of Columbia	--	--	--	--	--	--	--
Florida	23	38	22*	49*	56*	12*	58
Georgia	24*	24*	28	56	61	19*	68
Hawaii	22*	26*	--	--	--	--	--
Idaho	24*	29*	8*	35*	60	10*	55
Illinois	23	30*	10*	22*	61	14*	37*
Indiana	8*	20	8*	50	57	10*	60
Iowa	13*	13*	24*	38	79	4*	45
Kansas	21	12*	29*	42	74	12*	72
Kentucky	40	21*	24	39*	30*	14*	42
Louisiana	32	36	34*	63*	61	10*	88
Maine	31	23*	19*	--	51	15*	53*
Maryland	27	29*	10*	--	--	18*	72
Massachusetts	20*	33	4*	12*	30*	6*	48
Michigan	20	23	17*	35*	54	6*	49*
Minnesota	5*	10*	5*	26*	55*	5*	83
Mississippi	27	31*	19*	32*	71	21*	70
Missouri	18*	14*	13*	--	53	15*	63
Montana	19*	10*	11*	39	48	25*	69
Nebraska	13*	13*	7*	42*	63	8*	62
Nevada	18*	32	18*	--	--	18*	--
New Hampshire	8*	--	--	--	--	--	--
New Jersey	22	27	14*	--	--	12*	61
New Mexico	35	29	29*	74	69	5*	45
New York	18	31*	9*	29*	44*	4*	32*
North Carolina	30	28*	5*	--	--	16*	57
North Dakota	10*	12*	9*	31	53	10*	65
Ohio	22	23	18*	--	47	18	60
Oklahoma	16*	24	15*	47	69	26*	81
Oregon	34	34	9*	50	62	17	52
Pennsylvania	12*	6*	10*	--	40*	15*	73
Rhode Island	--	--	--	--	--	--	--
South Carolina	26	31	16*	50	62	12*	60
South Dakota	20	11*	22*	44	64	26	70
Tennessee	36	31*	27*	42*	65	19*	67
Texas	11*	25	15*	42*	61	16*	39
Utah	10*	28	7*	44	58	12*	--
Vermont	16*	28*	15*	--	--	3*	--
Virginia	21*	30	17*	--	41*	17*	68*
Washington	26	36	15*	27*	81	12*	41
West Virginia	29	4*	12*	57	69	12*	82
Wisconsin	22*	8*	23*	23*	66	9*	32*
Wyoming	11*	14*	16*	--	--	22	67

* coefficient of variation greater than 30 percent

-- too few cases for reliable estimate

NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

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Conclusion

This report addresses the issue of out-of-field teaching and educational equality. Rather than entering the debate as to how much teacher preparation, education, and training constitutes enough to be considered adequate, this analysis has intentionally adopted a conservative approach. The premise underlying the analysis is that adequately qualified staffing requires teachers, especially at the secondary school level and in the core academic fields, to hold, as a minimum prerequisite, at least a college minor in the fields they teach. Knowledge of subject matter does not, of course, guarantee qualified teachers, nor quality teaching. The premise is that basic subject knowledge is a necessary prerequisite for both. Of course, there may be teachers who are qualified despite not having a minor or major in their teaching assignment fields. But, the premise of this analysis is that even a moderate number of teachers lacking such minimal training prerequisites is a strong indication of inadequacies in the staffing of schools. Indeed, if a higher criterion had been adopted, such as requiring teachers to hold a college major instead of a college minor in the field, levels of out-of-field teaching would have increased dramatically (see, for example, McMillen and Bobbitt 1993; Bobbitt and McMillen 1995).

Using this minimal definition of adequate training, the analysis indicates that there were substantial levels of out-of-field teaching in 1990-91. That is, many students in public schools in grades 7-12, regardless of the type of school, were taught core academic subjects by teachers without at least a college minor in the field taught. For example, about one-quarter of all public school students enrolled in mathematics classes in grades 7-12, or about 4,124,000 of 15,510,000 students, were taught by teachers without at least a minor in mathematics or mathematics education.

These results have important implications and raise questions for several issues central to both education research and policy. First, what are the reasons, causes, or sources of out-of-field teaching? This report does not address this question, but other analyses using SASS data to examine out-of-field teaching offer some answers (see Ingersoll 1995a, 1995b). It is clear, for example, that out-of-field teaching is not due to a lack of education on the part of teachers; that is, out-of-field teaching is not a problem of poorly trained teachers. Out-of-field teaching is due to a lack of match between teachers' fields of training and their fields of assignment. The data also suggest that out-of-field teaching is not due to inadequacies in the overall quantity of supply—the reserve pool of teachers in

the nation. That is, out-of-field teaching is not a result of too few teachers. But, despite a large and diverse reserve pool and the widespread extent of basic training held by teachers, many school principals, nevertheless, report experiencing difficulties in finding qualified candidates to fill their teaching job openings. In these instances, the data indicate that school administrators commonly turn to the use of substitute teachers, in-school reassignments, and hiring of the underqualified as coping strategies. Out-of-field teaching assignments are the inevitable result of these kinds of coping strategies.

But, it remains unclear if out-of-field assignments are an emergency condition resulting from spot shortages of particular types of teachers at particular times in particular places, whether they are a short-term condition due to fiscal constraints in particular settings, or to what extent they are a chronic condition because this is a normal and ongoing practice in particular schools.

In addition, it is not at all clear whether the root of the problem is the failure of existing trained teacher candidates to seek positions, or whether the root of the problem is the inability of schools to attract, effectively utilize, and retain existing trained teacher candidates, or whether it is both. All these questions warrant further investigation.

Related to the question of the causes of out-of-field teaching, is a second question: why do some schools have more of it than others? In particular, why do low-income schools have higher levels of out-of-field teaching? One view, widely held among critics of educational inequality, is that low-income schools are not able to attract, or to retain, adequately trained teachers because they are unable to match the salaries, benefits, and resources offered by more affluent schools. As a result, these critics hold, such schools have difficulties hiring adequately trained teacher candidates and suffer from high levels of teacher turnover (e.g., Kozol 1991; Oakes 1990).

There has, however, been little empirical verification of this view, and, moreover, data from SASS suggest that this explanation may not be entirely correct. This report does not address the issue of why low-income schools have more out-of-field teaching than others, but related projects have begun to investigate this topic (see Ingersoll 1995b and 1995c). SASS data show, for example, that starting-level and advanced-level salaries in high-minority schools were not lower than in other schools in 1990-91. Indeed, overall, they were slightly higher than in schools serving predominantly white student populations (Choy et al. 1993, p.72). In addition, teacher turnover rates were also not appreciably higher in low-income schools in 1990-91 (Ingersoll 1995a). Low-income schools do appear to have more difficulty in filling teaching openings. But, these differences appear to account for some, but not all, of the high levels of misqualified teachers in such schools. SASS data show, for example, that several factors besides the overall poverty or affluence of the student population are related to the degree of out-of-field teaching in schools. For instance, school size and sector are both strongly related to out-of-field levels; small schools and private schools both have distinctly higher proportions of out-of-field teaching (Ingersoll 1995a, 1996b). These issues also warrant further research.

A third important issue concerns the issue of inequalities in access to qualified teachers, according to the race-ethnicity of students. As noted above, it is commonly believed among education analysts that both poor and minority students do not have equal access to qualified teachers (e.g., Kozol 1991; Oakes 1990). In contrast, this analysis finds few distinct differences in levels of out-of-field teaching, according to the proportion of minority students in classrooms or in schools. This does not mean, of course, that there are no inequalities in access to quality teaching and quality teachers, according to the race-ethnicity of students. There may be other kinds of differences in access that are not revealed by the data and measures used in this analysis. Moreover, this analysis does not separately examine different minority groups, and, hence, there may be differences in access between different minority groups not revealed here. What this analysis simply shows is that minority students, as a whole, were not more likely to have been taught by out-of-field teachers. Moreover, it also corroborates the importance of distinguishing between race-ethnicity and income/poverty characteristics of student populations.

A fourth issue is the source of within-school differences in the distribution of qualified teaching staff. As discussed above, numerous critics hold that lower track and lower achievement courses serving disadvantaged students are taught by the least qualified teachers (e.g., California Commission on the Teaching Profession 1985; Darling-Hammond 1987; Kopp 1992; Kozol 1991; Oakes 1990). These critics argue that students in low-achieving and low-track classes are the most at-risk, and they have the greatest need for and would benefit most from high quality teachers. In this view, assigning out-of-field teachers to teach such students is part of a pattern of unequal access to education resources that perpetuates unequal student educational outcomes.

On the other hand, other educators have argued that because good teachers are a scarce resource, it makes sense to place the most qualified teachers in the most advanced courses. In this view, high-track courses, such as classes for honors or gifted students, or classes at the senior high grade levels, require a greater level of mastery and training on the part of teachers than those at the lower track or junior high levels. Hence, in this view, assignment of the most qualified teachers to teach at the highest levels is not a matter of inequality, but of efficiency (e.g., Glazer 1987).

This analysis simply shows that lower grade levels, low-track and low-achievement-level classes, for example, do indeed have more out-of-field teaching. It does not address the issue of why these differences exist and whether or not they are necessary. Nor does this report address whether there are differences in out-of-field teaching within these groupings. There may be important differences in the extent to which different kinds of low-achieving or low-track students receive misqualified teachers, and with different implications. For instance, some have argued that misassignment and out-of-field teaching are especially consequential for a field such as special education, in which highly specialized training is essential. As a result, researchers have begun to investigate problems of teacher retention and misassignment in the field of special education using national data (see McMillen and Bobbitt 1993; Bobbitt and McMillen 1995; Boe 1993).

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A fifth issue concerns the consequences of out-of-field teaching for teachers and students. What is the impact on teachers of having to teach courses for which they have little formal background preparation? Does out-of-field teaching have any effect on classroom discipline? What limitations are imposed by a lack of background in the subject on the teachers' ability to teach for critical thinking and to engage the students' interest in the subject? Are out-of-field assignments partly responsible for the long-criticized tendency of school teachers towards over-reliance on textbooks? Is it possible to assess the benefits for students of being taught by an in-field teacher using student scores on mass-produced standardized examinations? All of these questions are of vital importance to education policy and warrant further investigation.

Technical Notes

The Schools and Staffing Survey

The primary data source for this report is the 1990-91 Schools and Staffing Survey (SASS), a nationally representative survey of teachers, principals, and schools conducted by the U.S. Department of Education's National Center for Education Statistics (NCES). The U.S. Census Bureau collected the SASS data for NCES in 1991 using a mail survey with telephone followup. The objective of SASS was to obtain information on the staffing, occupational, and organizational characteristics of schools in the United States.

Sample Selection[4]

Schools were the primary sampling unit for SASS. Each selected school received a school questionnaire and an administrator questionnaire. Next, a sample of teachers was selected within each school, and each received a teacher questionnaire. A Teacher Demand and Shortage (TDS) questionnaire was sent to the local education agency (LEA) associated with each selected public school. Also, an additional sample of public school districts not associated with the sampled schools received the TDS questionnaire. The private school questionnaire included TDS questions for the school. The sample for the SASS conducted during the 1990-91 school year included 12,856 schools and administrators, 65,217 teachers, and 5,515 local education agencies.

SASS was designed to provide national estimates for public and private schools; state estimates for public schools; state elementary, state secondary, and national combined estimates for public schools; affiliation- and grade-level estimates for private schools; estimates of change from 1988 to 1991 in school-level characteristics; and national estimates for schools with greater than 25 percent Indian enrollment. The teacher survey was designed to support comparisons between new and experienced teachers. Comparisons between bilingual and nonbilingual teachers are possible at the national level.

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[4] For a detailed description of the sample design of the 1990-91 SASS, see Kaufman and Huang (1993).

Selection of Schools

The public school sample of 9,586 schools was selected primarily from the 1988-89 school year Common Core of Data (CCD) file. The CCD is based on survey data collected annually by NCES from all state education agencies and is believed to be the most complete list of public schools available. The frame includes regular public schools, Department of Defense operated military base schools, and nonregular schools such as special education, vocational, and alternative schools.

The private school sample of 3,270 schools was selected primarily from the 1989-90 Private School Survey (PSS) list frame, which was based on the 1989 Quality of Education Data (QED) private school list, updated with 20 private school association lists provided to the Census Bureau in the spring of 1989.

To improve private school coverage, an area frame of schools was developed consisting of 123 sampling units (PSUs) selected with probability proportional to the square root of the PSU population. Within each PSU, a telephone search was conducted to find all in-scope private schools. Sources included yellow pages, religious institutions (except for Roman Catholic religious institutions, because each Catholic diocese is contacted annually when the QED list is updated), local education agencies, chambers of commerce, and local government offices. PSU schools not on the QED file nor the lists from private school associations were listed in the area school frame. From the frame, additional schools were eligible to be selected for the SASS private school sample.

The private school sample was designed to support estimates at the national and affiliation levels. The affiliation groups for private schools were determined by the school's orientation or affiliation group listed on the 1988-89 Private Schools Survey (the frame).

Selection of LEAs

All LEAs that had at least one school selected for the school sample were included in the LEA sample for the TDS questionnaire. Each Bureau of Indian Affairs and Department of Defense school was defined to be an LEA. Some LEAs did not have schools, but hired teachers who taught in schools in other LEAs. To ensure representation of these teachers, a sample of 135 LEAs without eligible schools was selected. Only 14 of the 135 were actually in scope (that is, were an operating public school agency that reported hiring teachers). All LEAs in Delaware, Nevada, and West Virginia were included to reduce high sampling errors in these states. The total LEA sample was 5,515.

Selection of Teachers

All 56,051 public and 9,166 private school teachers in the teacher samples were selected from the sampled public and private schools. The average number of teachers selected per school was 3.49, 6.98, and 5.23 teachers for public elementary, secondary, and combined

schools, respectively, and 3.78, 4.72, and 2.83 teachers for private elementary, secondary, and combined schools, respectively.

Data Collection

The data were collected for NCES by the U.S. Bureau of the Census. Questionnaires were mailed to school districts and administrators in December 1990 and to schools and teachers in January and February 1991.[5] Six weeks later, a second questionnaire was sent to each nonrespondent. A telephone follow-up of nonrespondents was conducted between March and June.

Weighting

Weights of the sample units were developed to produce national and state estimates for public schools, teachers, administrators, and LEAs. The private-sector data were weighted to produce national estimates and affiliation group estimates. The basic weights were the inverse of the probability of selection, and were adjusted for nonresponse and also to adjust the sample totals (based on responding, nonresponding, and out-of-scope cases) to the frame totals in order to reduce sampling variability.

Response Rates and Imputation

The final weighted questionnaire response rates were as follows:

	Public	Private
Teacher Demand and Shortage	93.5	----
Administrator	96.7	90.0
School	95.3	83.9
Teacher*	90.3	84.3

---- not applicable

*The response rates for public school teachers do not include the 5 percent of the public schools that did not provide teacher lists for the sampling of teachers, and the response rates for private school teachers do not include the 11 percent of the private schools that did not provide teacher lists. The effective response rate for public schools was 85.8 percent and for private schools, 75.9 percent.

Values were imputed for items with missing data by: (1) using data from other items on the questionnaire or a related component of the SASS (a school record to impute district

[5] Copies of the questionnaires may be obtained by writing to NCES at the address given at the end of this report.

data, for example); (2) extracting data from the sample file, such as the CCD or PSS; or (3) extracting data from a respondent with similar characteristics.[6]

Standard Errors and Statistical Significance

The data in this report are based on samples and, hence, are subject to sampling variability. In order to make proper inferences about the larger population of students which the samples represent, standard errors were calculated. If all possible population samples of the same size were surveyed under the same conditions, an interval of 1.96 standard error units below, to 1.96 standard error units above, a particular statistic would include the population value in approximately 95 percent of the cases. Note, however, that the standard errors do not take into account the effect of biases due to item nonresponse, measurement error, data processing error, or other possible systematic error.

The standard errors in this report were calculated using a balanced repeated replications procedure. Because this procedure incorporates the design features of complex sample surveys, the standard errors are generally higher than those calculated under the assumptions of simple random sampling. Standard errors for the tables are presented in Appendix A.

All comparisons of out-of-field teaching levels discussed in the text itself were tested for statistical significance using the student's t statistic at an alpha level of .05, or a 95 percent level of confidence. It should be noted that at times what may appear to be a difference in levels of out-of-field teaching between, for example, two types of schools, may actually not be of statistical significance. This does not mean there is no real difference in the levels of out-of-field teaching between these kinds of schools in the actual population of schools in the United States. It means that the apparent difference between the sample estimates is simply not great enough to conclude it could not be due to random variation in the sample.

This analysis used one-tailed t-tests of statistical significance because the objective of the report is to address the view that poor, minority, low-track, or low-achievement students are taught by lesser qualified teachers. Moreover, in keeping with the literature on teacher qualifications and equity, the comparisons here are made strictly between the high-end schools or classes and the low-end schools or classes. That is, the comparisons were between those schools in which a majority of the students were low-income or minority and those in which only a small minority of the students were low-income or minority; between high- and low-minority class enrollment; between high- and low-track classes; between high and low class achievement levels; or between 7th and 12th grade levels.

[6] For a detailed description of the imputation procedures in the 1990-91 SASS, see Kaufman and Huang (1993), pp. 60-87.

In this report, the comparisons between the different subject fields were simultaneous and multiple. When multiple statistical comparisons are made on the same data, it becomes increasingly likely that a difference in the sample does not actually indicate a real difference in the larger population. As the number of comparisons increases, so does the risk of making such an error in inference. To guard against this kind of error, this analysis used the Bonferroni procedure to adjust the alpha level for the t tests. After this adjustment, the critical values for the t statistics were as follows:

for comparisons among the four core academic fields, the critical value was 2.24
for comparisons within the sciences, the critical value was 2.13
for comparisons within social studies, the critical value was 1.96.

That is, to be deemed statistically significant, the t-test statistic for a given comparison had to have been greater than these values.

Information on Selected Variables

Poverty enrollment of school: The proportion of a school's student population that received the federal free or reduced-price lunch program, sponsored by the federal Department of Agriculture. The proportion of free-lunch recipients is a standard measure of poverty level in school populations because almost all public schools participate in the program. But, it must be interpreted with some caution. The number of children reported to be recipients may be an underestimate of poverty, because not all children who are eligible may identify themselves as such (especially at the secondary level).

Students receiving out-of-field teaching: This is a measure of the percentage of students enrolled in classes in each field who were taught by teachers who did not have at least a college minor in that field. This measure must be interpreted with some caution because the class enrollment figures for students were not necessarily a representative sample of students; the teachers assigned to the classes were the representative sample in SASS (students could, for instance, be counted more than once in separate class periods taught by different teachers).

Definitions of Fields

Field	Teacher Training (Major/Minor)	Teaching Assignments
social studies	psychology public affairs & services social studies/social science education economics history political science sociology other social sciences other area, ethnic studies	social studies history world civilization political science/government geography economics civics sociology/social organization other social science psychology
history	history	history world civilization
science	science education biology chemistry earth science/geology physics other natural sciences	general science biology/life science chemistry physics geology/earth science/space science other physical science other natural science
life science	biology	biology/life science
physical science	earth science/geology physics chemistry	chemistry physics geology/earth science/space science other physical science
English	communic & journalism English/language arts English education literature reading education	literature composition/journalism/creative writing reading other English/language arts course

Field	Teacher Training (Major/Minor)	Teaching Assignments
mathematics		
	engineering	general mathematics
	mathematics	business math
	mathematics education	algebra, elementary
		algebra, intermediate
		algebra, advanced
		geometry, plane/solid
		trigonometry
		analytical geometry
		probability/statistics
		calculus
		other mathematics

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Appendix A

Standard Errors

Table A.1 Standard errors for table 1: Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and selected school characteristics: 1990-91

	English	Math	Science	*Life Science*	*Physical Science*	Social Studies	*History*
Total	1.2	6.0	1.5	3.7	2.0	2.0	4.5
Minority Enrollment of School:							
Low-minority	2.3	7.0	2.3	3.9	4.8	1.2	2.7
Medium-minority	2.0	3.2	4.8	10.5	4.8	3.8	12.6
High-minority	2.7	6.3	4.3	5.7	4.5	2.3	5.5
Poverty Enrollment of School:							
Low-poverty	2.5	4.7	1.6	7.2	3.2	1.5	3.2
Medium-poverty	1.4	8.0	1.5	4.5	3.8	2.6	5.7
High-poverty	3.4	6.3	8.7	9.0	7.2	2.9	10.3

NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

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Table A.2 Standard errors for table 2: Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and selected *classroom* characteristics: 1990-91

	English	Math	Science	*Life Science*	*Physical Science*	Social Studies	*History*
Achievement Level of Class:							
Low-achievement	3.3	7.4	4.3	7.3	5.8	4.6	4.3
Average-achievement	1.6	7.1	1.5	6.4	3.6	1.7	5.8
High-achievement	1.9	5.0	1.6	6.2	2.6	1.7	5.5
Type or Track of Class:							
Low-track	1.8	8.0	3.8	3.3	6.4	2.5	5.2
Medium-track	1.7	2.8	3.2	6.6	6.6	2.2	6.5
High-track	1.5	6.9	4.3	4.6	5.4	2.8	5.6
Minority Enrollment of Class:							
Low-minority	1.9	6.1	2.3	3.8	3.3	2.0	3.1
Medium-minority	1.7	3.0	4.3	8.6	4.3	2.4	8.5
High-minority	2.7	7.1	4.0	5.2	3.9	2.5	6.6
Grade Level of Class:							
7th grade	3.4	11.5	7.0	5.5	13.2	4.3	9.3
8th grade	2.2	4.4	2.8	19.7	10.5	4.5	3.6
9th grade	2.5	3.9	2.2	7.4	3.9	4.3	12.7
10th grade	1.4	2.5	3.1	6.3	10.4	1.7	8.1
11th grade	1.7	3.8	1.1	10.2	6.8	1.1	3.9
12th grade	2.6	4.6	4.1	9.6	4.9	2.0	4.4

NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Table A.3 Standard errors for table 3: Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and by *state*: 1990-91

State	English	Math	Science	*Life Science*	*Physical Science*	Social Studies	*History*
Alabama	7.6	5.9	9.6	10.2	10.5	4.6	9.3
Alaska	6.3	13.8	12.6	--	10.4	5.7	--
Arizona	6.4	7.3	6.7	11.1	12.5	6.1	10.6
Arkansas	4.6	7.7	15.1	25.1	19.5	5.3	11.8
California	6.0	6.2	6.1	9.3	9.8	4.9	6.6
Colorado	4.1	5.2	5.9	10.4	9.6	3.6	13.2
Connecticut	8.4	10.3	10.6	--	--	5.7	--
Delaware	--	--	--	--	--	--	--
District of Columbia	--	--	--	--	--	--	--
Florida	7.1	10.0	16.9	21.4	22.2	5.1	8.7
Georgia	8.8	10.0	8.7	13.7	11.4	8.4	9.5
Hawaii	7.4	9.3	--	--	--	--	--
Idaho	9.8	12.2	4.3	12.1	17.5	9.5	16.6
Illinois	4.8	17.6	4.4	8.1	12.3	5.8	13.4
Indiana	4.0	5.6	4.3	12.1	13.7	4.6	11.9
Iowa	6.4	4.7	10.5	9.6	7.7	3.1	9.3
Kansas	4.4	7.2	10.5	11.9	21.0	4.6	15.0
Kentucky	13.0	7.6	8.8	15.0	9.9	5.1	9.1
Louisiana	5.9	7.9	13.9	19.7	17.8	3.7	10.9
Maine	8.6	7.0	8.1	--	13.5	7.8	16.0
Maryland	7.5	10.4	4.7	--	--	8.1	12.8
Massachusetts	7.2	6.3	3.2	6.0	9.2	4.4	7.8
Michigan	5.3	6.4	6.9	11.5	9.4	4.4	15.9
Minnesota	7.4	7.3	4.7	26.0	24.8	4.0	14.2
Mississippi	6.1	14.0	7.4	10.6	10.9	11.1	16.4
Missouri	6.3	13.2	7.7	--	15.7	5.9	13.2
Montana	7.4	3.3	4.0	11.6	9.6	17.6	16.3
Nebraska	4.3	4.6	4.6	14.1	13.2	3.3	10.3
Nevada	8.4	7.6	11.4	--	--	7.9	--
New Hampshire	3.8	--	--	--	--	--	--
New Jersey	6.3	7.0	7.4	--	--	4.3	10.9
New Mexico	6.3	6.9	11.9	12.1	14.1	3.2	8.7
New York	4.7	10.5	18.8	22.2	13.3	4.5	12.7
North Carolina	7.2	8.5	4.0	--	--	6.6	11.5
North Dakota	3.1	5.4	3.8	8.9	11.6	4.8	14.2
Ohio	5.7	5.7	8.2	--	6.7	5.3	7.3
Oklahoma	5.9	5.9	6.3	12.5	8.6	10.4	6.0
Oregon	7.0	7.8	2.9	10.9	10.8	3.7	11.4
Pennsylvania	5.5	4.8	4.6	--	12.6	7.9	10.7
Rhode Island	--	--	--	--	--	--	--
South Carolina	7.5	8.1	6.3	14.9	12.7	6.4	15.1
South Dakota	5.6	3.4	10.1	12.1	14.6	6.7	9.9
Tennessee	9.5	11.2	11.3	16.5	17.5	7.8	12.8
Texas	3.4	5.0	4.5	14.0	9.3	5.1	8.2
Utah	5.8	8.2	4.9	12.7	13.9	3.9	--
Vermont	15.1	8.9	9.2	--	--	2.8	--
Virginia	11.1	8.2	8.2	--	12.7	8.5	30.9
Washington	5.4	8.9	9.5	9.6	10.8	6.2	6.9
West Virginia	5.2	1.5	4.7	13.5	11.1	6.6	9.3
Wisconsin	7.2	4.5	11.9	10.1	10.7	2.9	10.6
Wyoming	4.5	5.6	6.8	--	--	6.2	9.0

-- too few cases for reliable estimate

NOTE: The estimates for Life Science, Physical Science, and History represent the proportion of students taught by teachers without at least a minor in *those particular subfields*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Appendix B

Additional Resources on the Schools and Staffing Survey

Additional Resources on the Schools and Staffing Survey (SASS)

SASS Data Products

The following SASS data products may be obtained free of charge while supplies last from:

U.S. Department of Education
National Center for Education Statistics
SASS Data Products
555 New Jersey Avenue, NW, Room 422
Washington, DC 20208-5651

Reports

- Out-of-Field Teaching and Educational Equality (NCES 96-040)
- Schools and Staffing in the United States: A Statistical Profile: 1993–94 (NCES 96-124)
- Private School Universe Survey, 1993–94 (NCES 96-143)
- SASS by State, 1993–94 Schools and Staffing Survey: Selected State Results (NCES 96-312)
- Comparing Key Organizational Qualities of American Public and Private Secondary Schools (NCES 96-322)
- Schools and Staffing in the United States: Selected Data for Public and Private Schools, 1993-94 (E.D. Tab, NCES 95-191)
- Private Schools in the United States: A Statistical Profile, 1990–91 (NCES 95-330)
- Teacher Supply in the U.S.: Sources of Newly Hired Teachers in Public and Private Schools, 1988–1991 (NCES 95-348)
- Characteristics of American Indian and Alaska Native Education, Results from the 1990–91 SASS (NCES 95-735)
- Teacher Supply, Teacher Qualifications and Teacher Turnover, Aspects of Teacher Supply and Demand in the U.S., 1990–91 (NCES 95-744)

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- The Patterns of Teacher Compensation (NCES 95-829)
- Characteristics of Stayers, Movers, and Leavers: Results from the Teacher Followup Survey, 1991-92 (E.D. Tab, NCES 94-337)
- SASS by State (NCES 94-343)
- Private School Universe Survey, 1991-92 (NCES 94-350)
- Qualifications of the Public School Teacher Workforce: 1988 and 1991 (NCES 94-665)
- America's Teachers: Profile of a Profession (NCES 93-025)
- Private School Universe Survey, 1989-90 (NCES 93-122)
- Selected Tables on Teacher Supply and Demand (E.D. Tab, NCES 93-141)
- Schools and Staffing in the United States: A Statistical Profile, 1990-91 (NCES 93-146)
- Schools and Staffing in the United States: Selected Data for Public and Private Schools, 1990-91 (E.D. Tab, NCES 93-453)
- Schools and Staffing in the United States: A Statistical Profile, 1987-88 (NCES 92-120)
- Characteristics of Stayers, Movers, and Leavers: Results from the Teacher Followup Survey, 1988-89 (E.D. Tab, NCES 91-128)

Forthcoming Reports

- Characteristics of American Indian and Alaska Native Education, Results from the 1993–94 SASS
- America's Teachers: Profile of a Profession, 1993–94
- The State of Teaching as a Profession, 1990–91
- The Effects of Professionalization on Teachers: A Multi-Level Analysis, 1990–91
- Time Spent Teaching Core Academic Subjects in Elementary Schools: Comparisons Across Community School, Teacher, and Student Characteristics
- Job Satisfaction Among America's Teachers: Effects of Workplace, Conditions, Background Characteristics, and Teacher Compensation, 1993–94
- A Profile of Administration Policies and Practices for Limited English Proficiency Students: Screening Methods, Teacher Training, and Program Support, 1993–94
- Private Schools in the U.S.: A Statistical Profile, 1993–94

- Sources of Newly Hired Teachers in Public and Private Schools, 1988–94
- Characteristics of Students' Programs: Results from Their Student Records, 1993–94
- Characteristics of Stayers, Movers, and Leavers: Results from the Teacher Followup Survey, 1994-95
- Characteristics of Public School Districts, 1993-94
- School Principals in the United States, 1993-94

Issue Briefs

- Are High School Teachers Teaching Core Subjects Without College Majors or Minors in Those Subjects? (Issue Brief, NCES 96-839)
- Where Do Minority Principals Work? (Issue Brief, NCES 96-840)
- What Academic Programs are Offered Most Frequently in Schools Serving American Indian and Alaska Native Students? (Issue Brief, NCES 96-841)
- How Safe are the Public Schools: What Do Teachers Say? (Issue Brief, NCES 96-842)
- Extended Day Programs in Elementary and Combined Schools (Issue Brief, NCES 96-843)
- What Criteria are Used in Considering Teacher Applicants? (Issue Brief, NCES 96-844)
- Private School Graduation Requirements (Issue Brief, NCES 95-145)
- How Much Time Do Public and Private School Teachers Spend in Their Work? (Issue Brief, NCES 95-709)
- Migration and Attrition of Public and Private School Teachers: 1991–92 (Issue Brief, NCES 95-770)
- Which Types of Schools Have the Highest Teacher Turnover? (Issue Brief, NCES 95-778)
- Libraries/Media Centers in Schools: Are There Sufficient Resources? (Issue Brief, NCES 95-779)
- Who Influences Decisionmaking About School Curriculum: What Do Principals Say? (Issue Brief, NCES 95-780)
- Public and Private School Principals: Are There Too Few Women? (Issue Brief, NCES 94-192)
- Sources of Newly Hired Teachers in Public and Private Schools, 1988-91 (Issue Brief, NCES 94-481)

- What are the Most Serious Problems in Schools? (Issue Brief, NCES 93-149)
- Teacher Salaries—Are They Competitive? (Issue Brief, NCES 93-450)
- Teaching and Administrative Work Experience of Public School Principals (Issue Brief, NCES 93-452)
- Teacher Attrition and Migration (Issue Brief, NCES 92-148)

Video

- Americas Teachers: Profile of a Profession

Methods

- 1993-94 Schools and Staffing Survey: Sample Design and Estimation (Technical Report, NCES 96-089)
- An Exploratory Analysis of Nonrespondents in the 1990-91 Schools and Staffing Survey (NCES 96-338)
- Design Effects and Generalized Variance Functions for the 1990–91 Schools and Staffing Surveys (SASS) Volume I--User's Manual (NCES 95-342I)
- Design Effects and Generalized Variance Functions for the 1990–91 Schools and Staffing Surveys (SASS) Volume II--Technical Report (NCES 95-340II)
- Quality Profile for SASS: Aspects of the Quality of Data in the Schools and Staffing Surveys (Technical Report, NCES 94-340)
- 1990-91 Schools and Staffing Survey: Sample Design and Estimation (Technical Report, NCES 93-449)
- Modeling Teacher Supply and Demand, with Commentary (Research and Development Report, NCES 93-461)
- 1987-88 Schools and Staffing Survey: Sample Design and Estimation (Technical Report, NCES 91-127)

CD-ROMs

- Schools and Staffing Survey: 1993–94 Electronic Codebook and Public Use Data
- Schools and Staffing Survey: 1990–91 Electronic Codebook and Public Use Data
- Schools and Staffing Survey, 1987–88 Microdata and Documentation

Questionnaires

- SASS and PSS Questionnaires 1993–1994 (NCES 94-674)
- SASS and TFS Questionnaires 1990–1991
- SASS and TFS Questionnaires 1987–1988

User's Manuals

- 1990–91 Schools and Staffing Survey: Data File User's Manual Volume I: Survey Documentation (NCES 93-144-I)
- 1990–91 Schools and Staffing Survey: Data File User's Manual Volume II: Restricted-Use codebook (NCES 93-144-II)
- 1990–91 Schools and Staffing Survey: Data File User's Manual Volume III: Public-Use codebook (NCES 93-144-III)
- 1990–91 Schools and Staffing Survey: Data File User's Manual Volume IV: Bureau of Indian Affairs (BIA) Restricted-Use Codebooks: Administrator, Schools, and Teachers (NCES 93-144-IV)
- 1991–92 Teacher Followup Survey Data File User's Manual—Public-Use Version (NCES 94-331)
- 1991–92 Teacher Followup Survey Data File User's Manual—Restricted-Use Version (NCES 94-478)
- 1988–89 Teacher Followup Survey Data File User's Manual—Public-Use Version (NCES 92-058)

Forthcoming User's Manuals

- 1993–94 Schools and Staffing Survey, Data File User's Manual Volume I: Survey Documentation
- 1993–94 Schools and Staffing Survey, Data File User's Manual Volume II: Restricted-Use Codebook
- 1993–94 Schools and Staffing Survey, Data File User's Manual Volume III: Public-Use Codebook
- 1993–94 Schools and Staffing Survey, Data File User's Manual Volume IV: Bureau of Indian Affairs (BIA) Restricted-Use Codebooks: Administrator, Schools, and Teachers
- 1993–94 Schools and Staffing Survey, Data File User's Manual Volume V: Restricted-Use Codebook Students' Records

Conference Papers

- Using Classroom Instructional Process Items in National Center for Education Statistics Study To Measure Student Opportunity to Learn: A Progress Report
- Heaven or Hell? The Teaching Environment of Beginning Teachers
- Using Opportunity to Learn Items in Elementary and Secondary National Surveys
- Characteristics of Public and Private School Teachers
- Characteristics of Mathematics and Science Teachers
- Teacher Training, Certification and Assignment
- Teacher Turnover: Patterns of Entry To and Exit from Teaching
- Moonlighting Among Public and Private School Teachers
- Characteristics of Bilingual Education and English as a Second Language Teachers
- Highlights of Minority Data from the Schools and Staffing Survey
- Teacher Incentive Research with SASS
- Teacher Salaries: Comparing States After Adjusting for Teacher Experience and Education
- What are the Characteristics of Principals Identified as Effective by Teachers
- Schools at Risk: Results of the 1987-88 Schools and Staffing Survey
- Destinations of Movers and Leavers: Where Do They Go?
- Teacher Salaries: Comparing States After Adjusting for Teacher Experience and Education
- Classroom Environment and Support of Beginning Teachers: A Test of the "Crucible versus Cradle" Theory of Teacher Induction
- Why do Teachers Leave Teaching? Reasons for Teacher Attrition from the Teacher Followup Survey

NCES Working Papers Related to SASS

WP 94-01 Schools and Staffing Survey (SASS). Papers Presented at the Meetings of the American Statistical Association

Section on Survey Research Methods, August 1992

a. "The Schools and Staffing Survey: Research Issues"
b. "The Schools and Staffing Survey: How Reinterview Measures Data Quality"
c. "Mail Versus Telephone Response in the 1991 Schools and Staffing Surveys"
d. "Questionnaire Research in the Schools and Staffing Survey: A Cognitive Approach"
e. "Balance Half-Sample Replication with Aggregation Units"
f. "Characteristics of Nonrespondents in the Schools and Staffing Surveys' School Sample"
g. "Improving Reliability and Comparability on NCES Data on Teachers and Other Education Staff"

Establishment Surveys Conference, June 1993

a. "Sampling Frames at the United States National Center for Education Statistics"
b. "Monitoring Data Quality in Education Surveys"

Section on Survey Research Methods, August 1993

a. "Generalization Variance Functions for the Schools and Staffing Surveys"
b. "A Bootstrap Variance Estimator for the Schools and Staffing Survey
c. "Adjusting for Nonresponse Bias of Correlated Items Using Logistic Regression"
d. "Comparisons of School Locale Setting: Self-Reported Versus Assigned"
e. "Characteristics of Nonrespondents to the 1990–91 Schools and Staffing Survey

Social Statistics Section, August 1993

a. "Implicit Markets for Teacher Quality and School Attributes"
b. "Who Decides? Principals' and Teachers' Views on Decision-Making"
c. "Determinants of Pupil-Teacher Ratios at School Sites: Evidence from the Schools and Staffing Survey"

WP 94-02 Generalized Variance Estimates for Schools and Staffing Survey (SASS)

WP 94-03 1991 Schools and Staffing Survey (SASS) Reinterview Response Variance Report

WP 94-04 The Accuracy of Teachers' Self-report on Their Postsecondary Education: Teacher Transcript Study, Schools and Staffing Survey

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WP 94-06 Six Papers on Teachers from the 1990–91 Schools and Staffing Survey and Other Related Surveys

a. "The Results of the 1993 Teacher List Validation Study (TLVS)"
b. "Designing the Teacher Follow-up Survey (TFS): Issues and Content)"
c. "Understanding the Supply of Elementary and Secondary Teachers: The Role of the School and Staffing Survey and the Teacher Followup Survey"
d. "Teacher Retention/Attrition: Issues for Research"
e. "Reflections on a SASS Longitudinal Study"
f. "Whither Didst Thou Go? Retention, Reassignment, Migration, and Attrition of Special and General Education Teachers in National Perspective"

WP 95-01 Schools and Staffing Survey: 1994. Papers Presented at the 1994 Meeting of the American Statistical Association (95-01)

Estimation Issues in School Surveys

a. "Intersurvey Consistency in School Surveys"
b. "Estimation Issues Related to the Student Component of the SASS"
c. "Properties of the Schools and Staffing Survey's Bootstrap Variance Estimator"
d. "Optimal Periodicity of a Survey: Sampling Error, Data Deterioration, and Cost"

Response and Coverage Issues in School Surveys

a. "Some Data Issues in School-Based Surveys"
b. "The 1991–92 Teacher Follow-up Survey Reinterview and Extensive Reconciliation"
c. "Improving Coverage in a National Survey of Teachers"
d. "Improving the Coverage of Private Elementary-Secondary Schools"

Education Research Using the Schools and Staffing Surveys and the National Education Longitudinal Study

a. "Adding Value to the Value-Added Educational Production Function Specification"
b. "Teacher Quality in Public and Private Schools"
c. "Teacher Shortages and Teacher Quality"
d. "Work Experience, Local Labor Markets, and Dropping out of High School"

WP 95-02 QED Estimates of the 1990–91 Schools and Staffing Survey: Deriving and Comparing QED School Estimates with CCD Estimates

WP 95-03 Schools and Staffing Survey: 1990–91 SASS Cross-Questionnaire Analysis

WP 95-08 CCD Adjustment to the 1990–91 SASS: A Comparison of Estimates

WP 95-09 The Results of the 1993 Teacher List Validation Study (TLVS)

WP 95-10 The Results of the 1991–92 Teacher Follow-up Survey (TFS) Reinterview and Extensive Reconciliation

WP 95-11 Measuring Instruction, Curriculum Content, and Instructional Resources: The Status of Recent Work

WP 95-15 Classroom Instructional Processes: A Review of Existing Measurement Approaches and Their Applicability for the Teacher Followup Survey

WP 95-16 Intersurvey Consistency in NCES Private School Surveys

WP 95-17 Estimates of Expenditures for Private K–12 Schools

WP 95-18 An Agenda for Research on Teachers and Schools: Revisiting NCES" Schools and Staffing Survey

WP 96-01 Methodological Issues in the Study of Teachers' Careers: Critical Features of a Truly Longitudinal Study

WP 96-02 Selected papers presented at the meeting of the 1995 American Statistical Association (96-02)

Overcoming the Bureaucratic Paradigm: Memorial Session in Honor of Roger Herriot

a. "1995 Roger Herriot Award Presentation"
b. "Space/Time Variations in Survey Estimates"
c. "Out of the Box: Again and Again, Roger Herriot at the Census Bureau"

Design and Estimation Issues for School Based Surveys

a. "Improving the Coverage of Private Elementary-Secondary Schools"
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Data Quality and Nonresponse in Education Surveys

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d. "Evaluation of Imputation Methods for State Education Finance Data"
e. "Variance Estimates Comparison by Statistical Software"
f. "Teacher Supply and Demand in the U.S."

WP 96-05 Cognitive Research on the Teacher Listing Form for the Schools and Staffing Survey

WP 96-06 The Schools and Staffing Survey (SASS) for 1998-99; Design Recommendations to Inform Broad Education Policy

WP 96-07 Should SASS Measure Instructional Processes and Teacher Effectiveness?

WP 96-09 Making Data Relevant for Policy Discussions: Redesigning the School Administrator Questionnaire for the 1998-99 SASS

WP 96-10 1998-99 Schools and Staffing Survey: Issues Related to Survey Depth

WP 96-11 Towards an Organizational Data Base on America's Schools: A Proposal for the Future of SASS, with Comments on School Reform, Governments, and Finance

WP 96-12 Predictors of Retention, Transfer, and Attrition of Special and General Education Teachers: Data from the 1989 Teacher Followup Survey

WP 96-15 Nested Structures: District Level Data in the SASS

WP 96-16 Strategies for Collecting Finance Data from Private Schools

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